We Claim:

1. A method for producing a glyoxalated polyacrylamide composition of improved stability useful for strengthening paper comprising reacting a first portion of glyoxal with a polyacrylamide having pendant amide groups to form a glyoxalated polyacrylamide and thereafter acidifying the glyoxalated polyacrylamide and adding a second portion of glyoxal to the acidified glyoxalated polyacrylamide to produce the glyoxalated polyacrylamide composition of improved stability.

2. The method of claim 1 wherein the polyacrylamide is prepared by free radical polymerization of an acrylamide monomer is the presence of a cationic co-monomer.

3. The method of claim 2 wherein the cationic co-monomer is selected from diallyl dimethyl ammonium chloride, 2-vinylpyridine, 4-vinylpryridine, 2-methyl-5-vinyl pyridine, 2-vinyl-N-methylpyridinium chloride, p-vinylphenyl-trimethyl ammonium chloride, 2-(dimethylamino) ethyl methacrylate, trimethyl(p-vinylbenzyl)ammonium chloride, p-dimethylaminoethylstyrene, dimethylaminopropyl acrylamide, 2-methylacroyloxyethyltrimethyl ammonium methylsulfate, 3-acrylamido-3-methylbutyl trimethyl ammonium chloride and 2-(dimethylamino) ethyl acrylate.

4. The method of claim 2 wherein the cationic co-monomer is used in a concentration of 0.1-25 mole percent of the acrylamide monomer.

5. The method of claim 3 wherein the cationic co-monomer is used in a concentration of 0.1-25 mole percent of acrylamide monomer.

6. The method of claim 2 wherein the polyacrylamide is prepared in the presence of a di-functional monomer to obtain a branched structure.

7. The method of claim 6 wherein the di-functional monomer is selected from the group consisting of N,N'-methylene-bisacrylamide, N,N'-methylene-bismethacrylamide, N-allyl acrylamide, N-allyl methacrylamide and mixtures thereof.

8. The method of claim 7 wherein the di-functional monomer is used in a concentration of 0.01-5.0 mole percent of acrylamide monomer.

9. The method of claim 1 wherein the first portion of glyoxal is provided in an amount of 10 to 60 mole percent of the pendant amide groups.

10. The method of claim 9 wherein the second portion of glyoxal is from about 1 to about 75 weight percent of the first portion of glyoxal.

11. The method of claim 9 wherein the second portion of glyoxal is from about 4 to about 50 weight percent of the first portion of glyoxal.

12. The method of claim 1 wherein an aldehyde scavenger is added to the glyoxalated polyacrylamide composition of improved stability.

13. The method of claim 2 wherein an aldehyde scavenger is added to the glyoxalated polyacrylamide composition of improved stability.

14. The method of claim 6 wherein an aldehyde scavenger is added to the glyoxalated polyacrylamide composition of improved stability.

15. The method of claim 11 wherein an aldehyde scavenger is added to the glyoxalated polyacrylamide composition of improved stability.

16. The method of claim 12 wherein the aldehyde scavenger is selected from the group consisting of lactic acid, malic acid, citric acid, choline chloride, and an adduct of choline chloride and acrylamide.

17. The method of claim 12 wherein the aldehyde scavenger is used in an amount of 0.0001 to 0.25 mole per mole of total glyoxal.

18. A glyoxalated polyacrylamide composition of improved stability prepared by reacting a first portion of glyoxal with a polyacrylamide having pendant amide groups to form a glyoxalated polyacrylamide and thereafter acidifying the glyoxalated polyacrylamide and adding a second portion of glyoxal to the acidified glyoxalated

polyacrylamide to produce the glyoxalated polyacrylamide composition of improved stability.

19. The glyoxalated polyacrylamide composition of claim 18 wherein the polyacrylamide is prepared by free radical polymerization of an acrylamide monomer is the presence of a cationic co-monomer.

20. The glyoxalated polyacrylamide composition of claim 19 wherein the cationic co-monomer is selected from diallyl dimethyl ammonium chloride, 2-vinylpyridine, 4-vinylpryridine, 2-methyl-5-vinyl pyridine, 2-vinyl-N-methylpyridinium chloride, p-vinylphenyl-trimethyl ammonium chloride, 2-(dimethylamino) ethyl methacrylate, trimethyl(p-vinylbenzyl)ammonium chloride, p-dimethylaminoethylstyrene, dimethylaminopropyl acrylamide, 2-methylacroyloxyethyltrimethyl ammonium methylsulfate, 3-acrylamido-3-methylbutyl trimethyl ammonium chloride and 2-(dimethylamino) ethyl acrylate.

21. The glyoxalated polyacrylamide composition of claim 20 wherein the polyacrylamide is prepared in the presence of a di-functional monomer to obtain a branched structure.

22. The glyoxalated polyacrylamide composition of claim 21 wherein the di-functional monomer is selected from the group consisting of N,N'-methylene-bisacrylamide, N,N'-methylene-bismethacrylamide, N-allyl acrylamide, N-allyl methacrylamide and mixtures thereof.

23. The glyoxalated polyacrylamide composition of claim 19 wherein the first portion of glyoxal is provided in an amount of 10 to 60 mole percent of the pendant amide groups.

24. The glyoxalated polyacrylamide composition of claim 23 wherein the second portion of glyoxal is from about 1 to about 75 weight percent of the first portion of glyoxal.

25. The glyoxalated polyacrylamide composition of claim 23 wherein the second portion of glyoxal is from about 4 to about 50 weight percent of the first portion of glyoxal.

26. The glyoxalated polyacrylamide composition of claim 18 wherein an aldehyde scavenger is added to the glyoxalated polyacrylamide composition of improved stability.

27. The glyoxalated polyacrylamide composition of claim 19 wherein an aldehyde scavenger is added to the glyoxalated polyacrylamide composition of improved stability.

28. The glyoxalated polyacrylamide composition of claim 25 wherein an aldehyde scavenger is added to the glyoxalated polyacrylamide composition of improved stability.

29. The glyoxalated polyacrylamide composition of claim 26 wherein the aldehyde scavenger is selected from the group consisting of lactic acid, malic acid, citric acid, choline chloride, and an adduct of choline chloride and acrylamide.

30. The glyoxalated polyacrylamide composition of claim 26 wherein the aldehyde scavenger is used in an amount of 0.0001 to 0.25 mole per mole of total glyoxal.

31. Paper strengthened with the glyoxalated polyacrylamide composition of claim 18, 23, 25, 26, or 30.